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EXAMINER	
CLARK, GREGORY D	

ART UNIT	PAPER NUMBER
1794	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/581,005	VESTWEBER ET AL.	
	Examiner	Art Unit	
	GREGORY CLARK	1794	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-24* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-24* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *05/26/2006, 02/02/2007*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

1. Claims 1-24 are rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for some compounds used as matrix materials, does not reasonably provide enablement for the full scope of the claims. The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the invention commensurate in scope with these claims.

2. Case law holds that applicant's specification must be "commensurately enabling [regarding the scope of the claims]" Ex Parte Kung, 17 USPQ2d 1545, 1547 (Bd. Pat. App. Inter. 1990). Otherwise undue experimentation would be involved in determining how to practice and use applicant's invention. The test for undue experimentation as to whether or not all compounds within the scope of claims 1-24 can be used as claimed and whether claims 1-24 meet the test is stated in Ex parte Forman, 230 USPQ 546,547 (Bd. Pat. App. Inter. 1986) and In re Wands, 8 USPQ2d 1400, 1404 (Fed.Cir. 1988). Upon applying this test to claims 1-24, it is believed that undue experimentation would be required because:

3. The quantity of experimentation necessary is great since claims 1-24 read on an innumerable number of compounds, which only possess a single **feature, Y=X, where** Y and X include numerous elements, while the specification discloses compounds which have only compounds where Y is C or P, and X is NR, O, S, Se or Te and R is 1-22 carbons atoms , OH, OR, NH2, NHR^6 or $N(R^6)_2$ Even among known materials with these features, the claims encompass devices which would be impossible or extremely difficult to fabricate using known methods.

4. There is no *direction or guidance presented* for synthesizing compounds other than where Y is C or P, and where X is NR, O, S, Se or Te and R is 1-22 carbons atoms , OH, OR, NH2, NHR^6 or $N(R^6)_2$ or devices with compounds which lack a large aromatic structure such as spirobifluorene.

5. There is an absence *of working examples* concerning compounds other than those where Y is C, S or P, and where X is O or devices with compounds which lack a large aromatic structure such as spirobifluorene.

6. In light of the above factors, it is seen that undue experimentation would be necessary to make and use the invention of claims 1-24.

7. The claims encompass an innumerable number of materials as matrix materials in an organic electroluminescent device, comprising only a single structural feature Y=X. The possibilities for elements Y and X include commonly used and also quite exotic combinations. While compounds having C=O, S=O, P=O, as well as C=S, P=S, C=N and even P=N bonds are known in the art, the

other combinations are quite uncommon and require very specialized synthetic techniques to synthesize. The specification provides no synthetic methods for producing compounds having structural features which are different from the ones mentioned above.

8. Furthermore, the claims encompass compounds which are so small as to be impossible to form into electroluminescent devices, not to mention the lack of suitability for such compounds in organic electroluminescent devices. Highly volatile compounds, such as acetone and simple ketones are included in the scope. These compounds are liquids, and many evaporate rapidly at room temperature. As such, no guidance is provided for how they could be fabricated into an organic electroluminescent device, since known deposition methods would not work.

9. In short, the specification provides guidance for the use of a limited subset of compounds within the scope of the present claims, specifically compounds comprising large aromatic substituents, such as spirobifluorene. Some other compounds of this type, aromatic compounds sporting functional groups where Y is C or P, and where X is NR, O, S, Se or Te and R is 1-22 carbons atoms , OH, OR, NH2, NHR^6 or $N(R^6)_2$, would be available to one of ordinary skill using known synthetic methods. However, given the lack of guidance in the specification, one of ordinary skill would not be able to make compounds within the scope of the present claims, or utilize them as matrix materials in an organic electroluminescent device.

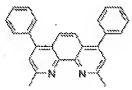
Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

10. **Claims 1-2 and 23-24 are rejected under 35 U.S.C. 102(b) as being anticipated by Stossel (DE 103 10 887.4) or WO 2004/081017. The US PG Pub 2006/0220004 is being relied upon as a direct translation or WO 2004/081017.**

11. **Regarding Claims 1, 23-24**, Stossel discloses an organic electroluminescent device (paragraph 1) containing an anode (paragraph 9), a cathode (paragraph 7), a matrix material (4,4'-bis(carbazol-9-yl)biphenyl (CBP)) doped with a phosphorescent emitter (paragraph 152), and a hole blocking layer containing BCP (2,9-dimethyl-4,7-diphenyl-1,10-phenanthroline=bathocuproin) (paragraph 149). The structure of BCP is shown below:



BCP

The examiner notes that BCP meets the criteria Y=X where X is a nitrogen (N) which has a non-bonding electron pair and X stands for NR where R is a carbon atom (C). The matrix material is not the same as the hole blocking layer.

Stossel also discloses that the matrix materials provide electronic components, in organic light-emitting diodes (OLEDs), organic integrated circuits (O-ICs), organic field-effect transistors (OFETs), organic thin-film transistors (OTFTs), organic solar cells (O-SCs) or organic laser diodes (O-lasers) (Paragraph 86)(per claims 23 and 24).

12. **Regarding Claim 2**, Stossel discloses a hole blocking layer containing BCP (2,9-dimethyl-4,7-diphenyl-1,10-phenanthroline=bathocuproin) (paragraph 149). The examiner notes that the hole blocking material disclosed by Stossel meets the criteria of Formula 2 (shown below) claimed by the applicant.

Formula (2)

BCP shows Y is C (per claim 2)

X is NR4

R1 and R2 are different and are heteroaromatic rings

R4 is a heteroaromatic ring

13. **Claims 1-3, 5-12, 16-22 are rejected under 35 U.S.C. 102(b) as being anticipated by Gerhard (DE 103 17 556.3) or WO 2006/0208221. The US PG Pub 2006/0208221 is being relied upon as a direct translation or WO 2006/0208221.**

14. **Regarding Claim 1**, Gerhard discloses and organic electroluminescent device (paragraph 1) containing an anode (paragraph 22), a cathode (paragraph 28), a matrix material (4,4'-bis(carbazol-9-yl)biphenyl (CBP)) doped with a phosphorescent emitter (paragraph 25), and a hole blocking layer containing BCP (2,9-dimethyl-4,7-diphenyl-1,10-phenanthroline=bathocuproin) or bis(2-methyl-8-quinolinolato) (paragraph 25). The structure of BCP is shown above.

The examiner notes that BCP meets the criteria Y=X where X is a nitrogen (N) which has a non-bonding electron pair and X stands for NR where R is a carbon atom. The matrix material is not the same as the hole blocking layer.

Gerhard also discloses that the matrix materials provide electronic components, in particular organic electroluminescent devices (OLEDs), organic solar cells (O-SCs), organic field-effect transistors (O-FETs) or else organic laser diodes (O-laser) (paragraph 107) (per claims 23 and 24).

15. **Regarding Claim 2**, Gerhard discloses a hole blocking layer containing BCP (2,9-dimethyl-4,7-diphenyl-1,10-phenanthroline=bathocuproin) (paragraph 25). The examiner notes that the hole blocking material disclosed by Gerhard meets the criteria of Formula 2 (shown above) claimed by the applicant.

BCP shows Y is C (per claims 2 and 3)

X is NR4

R1 and R2 are different and are heteroaromatic rings

R4 is a heteroaromatic ring

16. **Regarding Claim 3**, Gerhard discloses that the matrix materials include 1,3,5-trisubstituted benzene ketones (paragraph 52). The examiner notes that for such materials Y=C and X=O.

17. **Regarding Claim 5**, Gerhard discloses the hole blocking layer can be composed of BCP (2,9-dimethyl-4,7-diphenyl-1,10-phenanthroline=bathocuproin) (hole blocking material B) (paragraph 25). The examiner takes the position that BCP is the only material in the hole blocking layer .

18. **Regarding Claims 6-9**, Gerhard discloses matrix materials (hole blocking materials) can be represented by Formula (s) 3-5:


3


4


5

Gerhard further discloses that the above formulas are suitable matrix materials (hole blocking material) do not have a planar structure (per claim 6) and include a sp3

hybridized carbon atom (per claim 7) which includes a secondary, tertiary or quaternary carbon atom (per claim 8 and 9) (paragraph 48).

19. **Regarding Claim 10,** Gerhard discloses and organic electroluminescent device (paragraph 1) that includes 9,9'-spirobifluorene derivatives, indenofluorene derivatives, dihydrophenanthrene derivatives, triptycene derivatives and hexaarylbenzene derivatives (paragraph 49).

20. **Regarding Claim 11,** Gerhard discloses that at least one of the R1 to R3 radicals contains a 9,9'-spirobifluorene derivative (paragraph 49).

21. **Regarding Claim 12,** Gerhard discloses and organic electroluminescent device (paragraph 1) that includes matrix materials selected from carbazoles such as CBP (paragraph 25) or organometallic complexes (paragraph 18).

22. **Regarding Claim 16,** Gerhard discloses and organic electroluminescent device that contain phosphorescence emitters such as tris(2-phenylpyridyl) iridium (paragraph 25).

23. **Regarding Claim 17,** Gerhard discloses and organic electroluminescent device where the matrix material has a glass transition temperature of greater than 100 deg C. he applicant claims a glass transition temperature of greater than 100 deg C.

24. **Regarding Claim 18,** Gerhard discloses and organic electroluminescent device (paragraph 1) that includes 9,9'-spirobifluorene derivatives (paragraph 49) and these materials are made by a sublimation process (paragraph 118).

25. **Regarding Claims 19-22,** Gerhard discloses that the layers of the electroluminescent device can be applied by vacuum evaporation, evaporation in a carrier gas stream (OVPD, organic vapor phase deposition), printing process, an ink jet printing process, and a LITI printing process (paragraph 95).

26. **Claims 4 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gerhard (DE 103 17 556.3) or (WO 2004/093207). The US PG Pub 2006/0208221 is being relied upon as a direct translation of WO 2004/093207.**

27. **Regarding Claim 4,** Gerhard discloses and organic electroluminescent device (paragraph 1) containing a hole blocking layer made of BCP (2,9-dimethyl-4,7-diphenyl-1,10-phenanthroline=bathocuproin). Gerhard fails to mention the percentage of BCP in the hole blocking layer. The applicant claims a concentration of at least 50%.

The examiner takes the position that hole blocking layers are known in the art to prevent absorption in undesired region of the electromagnetic spectrum.

With a reasonable expectation of successful a person of ordinary skill in the art would have applied the BCP in the device at varying levels to optimize the blocking effect which would have included the range claimed by the applicant.

28. **Regarding Claim 13,** Gerhard discloses and organic electroluminescent device (paragraph 1) and the device can include the following layers: hole injection layer, hole transport layer, hole blocking layer, electron transport layer and/or electron injection layer. Gerhard fails to mention a hole blocking layer directly adjacent to the electron injection layer of cathode.

The examiner takes the position that it is common the art to vary the location of the individual layers in relation to each other in order to optimize the overall device properties such as: voltage requirements and optimal emission in desired regions. With the expectation of success, a person of ordinary skill in the art would test the device performance by comparing a number of different structural layer arrangements which would have include the hole blocking layer adjacent to the hole injection layer or cathode.

29. **Claims 14-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gerhard (DE 103 17 556.3) or (WO 2004/093207) in view of Lamansky (20020182441). The US PG Pub 2006/0208221 is being relied upon as a direct translation of WO 2004/093207.**

30. **Regarding Claims 14 and 15,** Gerhard discloses and organic electroluminescent device (paragraph 1) containing a matrix material (4,4'-bis(carbazol-9-yl)biphenyl (CBP) doped with a phosphorescence emitters such as tris(2-phenylpyridyl)iridium (paragraph 25). Phosphorescent emission involves in complexes containing at least one element of atomic number greater than 20 (paragraph 37). The applicant claims an atomic number of greater than 36 and less than 84 (per claim 14) and greater than 56 and less than 80 (per claim 15).

The examiner takes the position that the effect of atomic number on phosphorescence is well known in the art as the heavy metal effect.

Lamansky teaches that phosphorescence can be enhanced over fluorescence by confining, preferably through bonding, the organic molecule in close proximity to an atom of high atomic number. This phenomenon, called the heavy atom effect, is created by a mechanism known as spin-orbit coupling (paragraph 5).

With a reasonable expectation of success, a person of ordinary skill in the art at the time of the invention would have tested various metals to optimize the phosphorescent properties of the metal complex which would have included atoms with the atomic number ranges claimed by the applicant.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to GREGORY CLARK whose telephone number is

(571)270-7087. The examiner can normally be reached on M-Th 7:00 AM to 5 PM Alternating Fri 7:30 AM to 4 PM and Off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Larry Tarazano can be reached on (571) 272-1515. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/D. Lawrence Tarazano/
Supervisory Patent Examiner, Art Unit 1794

GREGORY CLARK/GDC/
Examiner
Art Unit 1794